Peridynamics for Multiscale Materials Modeling

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The peridynamic model is a reformulation of continuum mechanics based on integral equations. It is a nonlocal model, accounting for the effects of long-range forces. Unlike classical elasticity, peridynamics does not utilize stress/strain relationships and does not assume even weak differentability of the displacement field, although classical elasticity can be shown to be a special case of the peridynamic model. Further, a particular discretization of the peridynamic model has the same computational structure as molecular dynamics, prompting its investigation as a coarse-graining of of molecular dynamics.

In this talk, we survey the analytical, numerical, and computational connections between peridynamics, continuum mechanics and molecular dynamics.

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